3GPP TS 43.059 V6.4.0 (2004-11)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Functional stage 2 description of Location Services (LCS) in GERAN (Release 6)

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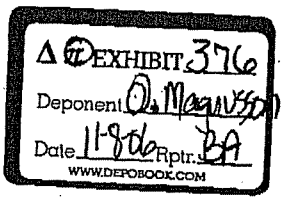

Keywords
GSM, location, stage 2

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

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Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the stage 2 of the LoCation Services (LCS) feature in GERAN, which provides the mechanisms to support mobile location services for operators, subscribers and third party service providers.

The purpose of this stage 2 specification is to define the GERAN LCS architecture, functional entities and operations to support location methods. This description is confined to the aspects of LCS within the GERAN and does not define nor describe the LCS entities or operations within the Core Network.

Location Services may be considered as a network provided enabling technology consisting of standardised service capabilities, which enable the provision of location applications. The application(s) may be service provider specific. The description of the numerous and varied possible location applications which are enabled by this technology are outside the scope of the present document. However, clarifying examples of how the functionality being described may be used to provide specific location services may be included.

This stage 2 specification covers the GERAN LCS functional model and entities, the location methods, state descriptions, and message flows.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.071: "Location Services (LCS); Service description - Stage 1".

[3] 3GPP TS 22.101: "Service aspects; Service principles".

[4] 3GPP TS 23.007: "Restoration procedures".

[5] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[6] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[7] 3GPP TS 23.271: "Functional stage 2 description of location services".

[8] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specificiation; Core Network Protocols; Stage 3".

[9] 3GPP TS 24.030: "Location Services (LCS); Supplementary service operations; Stage 3".

[10] 3GPP TS 24.080: "Mobile radio Layer 3 Supplementary Services specification; Formats and coding".

[11] 3GPP TS 43.051: "GSM/EDGE Radio Access Network (GERAN) overall description; Stage 2".

[12] 3GPP TS 44.006: "Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification".

[13] 3GPP TS 44.012: "Short Message Service Cell Broadcast (SMSCB) Support on the Mobile Radio Interface".

[14] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control Protocol".

[15] 3GPP TS 44.031: "Location Services (LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC) Radio Resource LCS Protocol (RRLP)".

[16] 3GPP TS 44.035: "Location Services (LCS); Broadcast Network Assistance for Enhanced Observed Time Difference (E-OTD) and Global Positioning System (GPS) Positioning Methods".

[17] 3GPP TS 44.071: "Location Services (LCS); Mobile Radio Interface Layer 3 Location Services (LCS) specification".

[18] 3GPP TS 48.008: "Mobile-services Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification".

[19] 3GPP TS 48.031: "Location Services (LCS); Serving Mobile Location Centre - Serving Mobile Location Centre (SMLC - SMLC); SMLCPP specification".

[20] 3GPP TS 48.058: "Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

[21] 3GPP TS 48.071: "Serving Mobile Location Center – Base Station System (SMLC-BSS) interface; Layer 3 specification".

[22] 3GPP TS 49.031: "Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE)".

[23] TIA/EIA/IS-J-STD-036 (2000): "Emergency Services Data Communications".

[24] 3GPP TS 48.016: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) interface; Network Service".

[25] 3GPP TS 48.018: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

[26] 3GPP TS 44.064: "Mobile Station - Serving GPRS Support Node (MS-SGSN) Logical Link Control (LLC) layer specification".

[27] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[28] 3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[29] 3GPP TS 25.410: "UTRAN Iu Interface: General Aspects and Principles".

[30] 3GPP TS 25.411: "UTRAN Iu Interface Layer 1".

[32] 3GPP TS 25.412: "UTRAN Iu Interface signalling transport".

[33] 3GPP TS 25.413: "UTRAN Iu Interface RANAP signalling".

[34] 3GPP TS 44.118: "Mobile radio interface layer 3 specification; Radio Resource Control (RRC) Protocol Iu Mode".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document the following terms and definitions apply and the terms and definitions given in 3GPP TS 22.101.

A/Gb mode: see 3GPP TS 43.051 [11].

Iu mode: see 3GPP TS 43.051 [11].

LCS (LoCation Services): LCS is a service concept in system standardisation. LCS specifies all the necessary network elements and entities, their functionality, interfaces, as well as communication messages, necessary to implement the positioning functionality in a cellular network.

NOTE 1: LCS does not specify any location based (value added) services except locating of emergency calls.

LCS Client: software and/or hardware entity that interacts with a LCS Server for the purpose of obtaining location information for one or more Mobile Stations. LCS Clients subscribe to LCS in order to obtain location information. LCS Clients may or may not interact with human users. The LCS Client is responsible for formatting and presenting data and managing the user interface (dialogue). The LCS Client may reside in the Mobile Station (MS).

LCS Server: software and/or hardware entity offering LCS capabilities. The LCS Server accepts requests, services requests, and sends back responses to the received requests. The LCS server consists of LCS components, which are distributed to one or more PLMN and/or service provider.

Location Estimate: geographic location of an MS and/or valid Mobile Equipment (ME), expressed in latitude and longitude data. The Location Estimate shall be represented in a well-defined universal format. Translation from this universal format to another geographic location system may be supported, although the details are considered outside the scope of the primitive services.

Mobile Assisted positioning: any mobile centric positioning method (e.g. E-OTD, GPS) in which the MS provides position measurements to the network for computation of a location estimate by the network. The network may provide assistance data to the MS to enable position measurements and/or improve measurement performance.

Mobile Based positioning: any mobile centric positioning method (e.g. E-OTD, GPS) in which the MS performs both position measurements and computation of a location estimate and where assistance data useful or essential to one or both of these functions is provided to the MS by the network. Position methods where an MS performs measurements and location computation without network assistance data are not considered within this category.

Mobile Station: consists of Mobile or User Equipment (ME or MS) with a valid SIM or USIM attached

Positioning (/location detecting): positioning is a functionality, which detects a geographical location (of e.g. a mobile terminal)

Positioning technology (/locating technology): technology or system concept including the specifications of RF interfaces, data types, etc. to process the estimation of a geographical location, e.g. GPS and E-OTD

Radio Interface Timing: Comprise Absolute Time Differences (ATDs) or Real Time Differences (RTDs) of the signals transmitted by Base Stations, where timing differences are measured relative to either some absolute time difference (ATD) or the signals of another Base Station (RTD)

RRLP maximum PDU size: maximum PDU size for the RRLP protocol, which is 242 octets

RRLP pseudo-segmentation: use of several RRLP data messages to deliver a large amount of information

Target MS: Mobile Station being positioned

Type A LMU: accessed exclusively over the air interface (Um interface): there is no wired connection to any other network element

Type B LMU: is accessed over the Abis interface from a BSC. The LMU may be either a standalone network element addressed using some pseudo-cell ID or connected to or integrated in a BTS

NOTE 2: Abis interface is beyond the scope of the present document.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations and the abbreviations given in 3GPP TS 21.905 apply.

2G-	Second Generation
3G-	Third Generation
A	Interface between GERAN BSS and MSC
A-GPS	Assisted GPS

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ATD	Absolute Time Difference
BSSLAP	Base Station System Application Part
BSSAP-LE	Base Station System Application Part LCS Extension
CBC-BSC	Interface between CBC and BSC
CBC-SMLC	Interface between CBC and SMLC
D-GPS	Differential GPS
E-OTD	Enhanced Observed Time Difference
Iu	Interface between GERAN BSS and 3G Core Network
Iu-cs	Interface between GERAN BSS and 3G MSC
Iu-ps	Interface between GERAN BSS and 3G SGSN
Gb	Interface between GERAN BSS and SGSN
Lb	Interface between SMLC and BSC
LCCF	Location Client Control Function
LCF	Location Client Function
LSBcF	Location System Broadcast Function
LSCF	Location System Control Function
LSOF	Location System Operation Function
PCF	Position Calculation Function
PRCF	Positioning Radio Co-ordination Function
PRRM	Positioning Radio Resource Management
PSMF	Positioning Signal Measurement Function
RIT	Radio Interface Timing
RRLP	Radio Resource Link Protocol
RTD	Real Time Difference
SMSCB	Short Message Service Cell Broadcast
SMLCPP	Serving Mobile Location Center Peer Protocol
TA	Timing Advance
UDT	SCCP Unitdata message
Um	GERAN Air Interface
UTC	Universal Coordinated Time
U-TDOA	Uplink Time Difference of Arrival

4 Main concepts

A general description of location services and the service requirements is given in the specification 3GPP TS 22.071. By measuring radio signals the capability to determine the geographic location of the mobile station (MS) shall be provided. The location information may be requested by and reported to a client (application) associated with the MS, or by a client within or attached to the Core Network. The location information may also be utilised internally by GERAN, for example to support features such as home location billing. The location information shall be reported in standard formats, such as those for cell based or geographical coordinates of the location of the MS.

It shall be possible for the majority of the MS (active or idle) within a network to use the feature without compromising the radio transmission or signalling capabilities of the GERAN.

Four positioning mechanisms are supported for LCS: Timing Advance (TA), Enhanced Observed Time Difference (E-OTD), Global Positioning System (GPS) and Uplink Time Difference Of Arrival (U-TDOA).

4.1 Assumptions

- SMLC is either an integrated functionality in BSS or a standalone network element within GERAN.
- LMU is either an integrated functionality in BTS (Type B LMU) or a standalone network element (Type A LMU) where communication is over the Um interface.

4.2 Standard LCS Methods

4.2.1 Timing Advance

The TA is based on the existing Timing Advance (TA) parameter. The TA value is known for the serving BTS. To obtain TA values in case the MS is in idle mode a special procedure, not noticed by the GSM subscriber (no ringing tone), is set up. The cell-ID of the serving cell and the TA is returned as the result of the TA.

TA may be used to assist all positioning mechanisms.

4.2.2 Enhanced Observed Time Difference (E-OTD) positioning mechanism

The E-OTD method is based on measurements in the MS of the Enhanced Observed Time Difference of arrival of bursts of nearby pairs of BTSs. For E-OTD measurement synchronization, normal and dummy bursts are used. When the transmission frames of BTSs are not synchronized, the network needs to measure the Real or Absolute Time Differences (RTDs or ATDs) between them. To obtain accurate trilateration, E-OTD measurements and, for non-synchronized BTSs, RTD or ATD measurements are needed for at least three distinct pairs of geographically dispersed BTSs. Based on the measured E-OTD values the location of MS can be calculated either in the network or in the MS itself, if all the needed information is available in MS.

4.2.3 Global Positioning System (GPS) positioning mechanism

The Global Positioning System (GPS) method refers to any of several variants that make use of GPS signals or additional signals derived from GPS signals in order to calculate MS position. These variants give rise to a range of optional information flows between the MS and the network. One dimension of variation is where position calculation is performed at: a) MS-based PCF or b) network-based PCF. Another dimension is whether "assistance data" is required - irrespective of where position calculation is performed. Examples of assistance data include differential GPS data; lists of satellites in view based on approximate MS position, etc. A third dimension of variation is closely related to the preceding, namely, the origin and distribution of any assistance data. For example, even while assistance data may be required of a GPS method, it may be optional that the assistance data originates from and is distributed within and by the PLMN, VPLMN, etc.

4.2.4 Uplink Time Difference of Arrival (U-TDOA) positioning mechanism

The U-TDOA positioning method is based on network measurements of the Time Of Arrival (TOA) of a known signal sent from the mobile and received at three or more LMUs. The known signal is the normal bursts generated by a mobile while in the dedicated mode; either on the SDCCH or TCH. The method requires LMUs in the geographic vicinity of the mobile to be positioned to accurately measure the TOA of the bursts. Since the geographical coordinates of the measurement units are known, the mobile position can be calculated via hyperbolic trilateration. This method will work with existing mobiles without any modification.

5 GERAN LCS Architecture

Figure 1 shows the general arrangement of the Location Service feature. This illustrates, generally, the relation of LCS Clients and servers in the core network with the GERAN. The definition and operation of LCS entities operating in the core network is outside the scope of the present document. The LCS entities within the GERAN communicate with the Core Network (CN) across the A, Gb and Iu interfaces.

Communication among the GERAN LCS entities makes use of the messaging and signalling capabilities of the GERAN.

As part of their service or operation, the LCS Clients may request the location information of Mobile Station. There may be more than one LCS client. These may be associated with the core network, associated with the GERAN, operated as part of a MS application or accessed by the MS through its access to an application (e.g. through the Internet).

Figure 35 describes the deciphering key delivery mechanism.

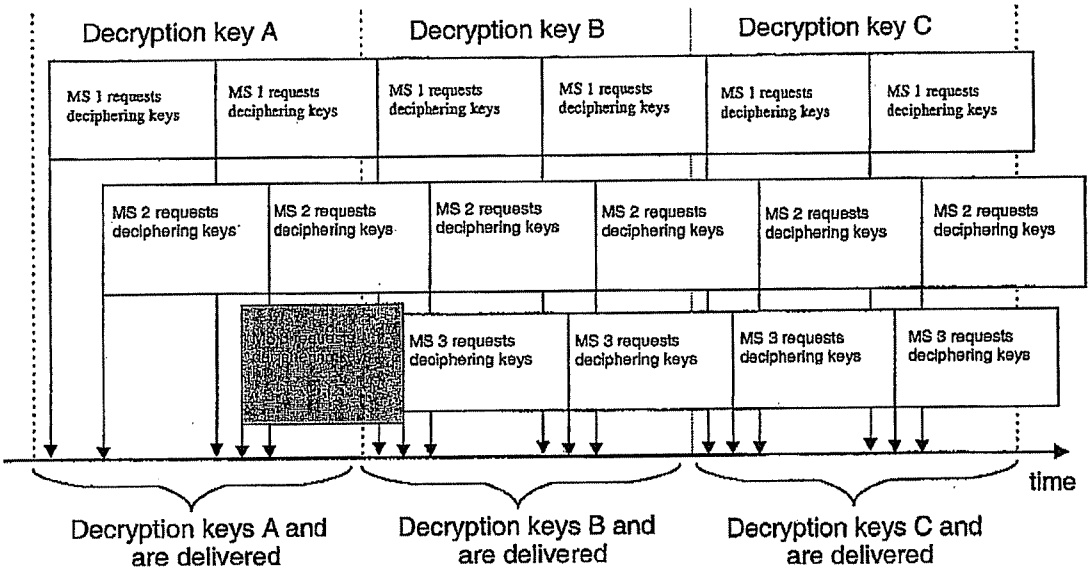

Figure 35: Deciphering key delivery

- First the key A is the Current Deciphering Key and key B is the Next Deciphering Key.
- When the SMLC changes to use the key B (Next Deciphering Key) then the Deciphering Key Flag state is changed in the LCS Broadcast Data message. At this point the coordinating SMLC delivers the new deciphering key set to other SMLCs in the same location area as well as to MS when MS is requesting the keys during the location update (IMSI Attach, Normal or Periodic Location Update).
- The new deciphering key set contains now key B as the Current Deciphering Key, key C as new Next Deciphering Key and the Ciphering Key Flag currently in use in that location area.
- When the SMLC changes to use the key C (Next Deciphering Key) then the Ciphering Key Flag state is changed in the LCS Broadcast Data message. At this point the coordinating SMLC delivers the new deciphering key set to other SMLCs in same location area as well as to MS when MS is requesting the new set during the location update (IMSI Attach, Normal or Periodic Location Update).
- The new deciphering key set contains now key C as the Current Deciphering Key, key D as new Next Deciphering Key and the Ciphering Key Flag currently in use in that location area.

The process continues as above when the keys are changed. The lifetime of one key (Current/Next Ciphering Key) is minimum one periodic location update period used in the location area.

9.5 U-TDOA Positioning Procedures

9.5.0 General

Following the receipt of a location request message from the BSC, the U-TDOA capable SMLC interrogates the BSS for the RF channel information associated with the MS to be located. The SMLC uses this information to task the LMUs at the serving and surrounding cells. The LMUs are tasked to measure the identified RF channel(s) and thus provide a time reference from different LMUs. The time-of-arrival information from the tasked LMUs is returned to the SMLC where the MS location is calculated.

9.5.1 U-TDOA Positioning in CS Domain for A/Gb-mode

9.5.1.1 General Procedures

The U-TDOA location method uses the uplink energy transmitted by an MS to make a location determination. If the MS was in the dedicated mode, carrying subscriber traffic prior to the beginning of the location process, the energy associated with this subscriber traffic can be used to locate the MS. If the MS was placed in the dedicated mode by the MSC specifically for location determination purposes, either the SDCCH or TCH can be used for U-TDOA location purposes.

9.5.1.2 CS U-TDOA Messages and Procedures on the Lb Interface

The following section describes the positioning procedure for CS U-TDOA location determination on the Lb interface.

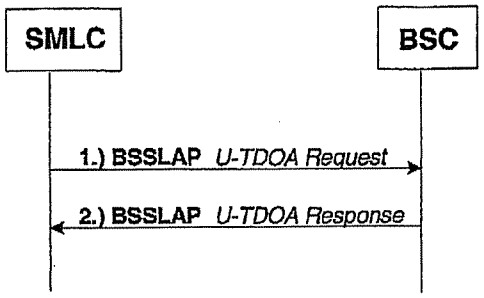

Figure 36: CS U-TDOA Positioning Procedure

1. The SMLC sends a BSSMAP-LE Connection Oriented Information message to the BSC that contains the embedded BSSLAP U-TDOA Request message. The U-TDOA Request message may contain the delta timer value. The BSC starts the delta timer, received or internal, immediately after sending the U-TDOA Response message to the SMLC. The purpose of this timer is to define the maximum time during which the BSC supervises the location request.

2. The BSC sends a BSSMAP-LE Connection Oriented Information message to the SMLC that contains the embedded BSSLAP U-TDOA Response message. The U-TDOA Response message contains; the physical channel information (frequencies, hopping sequence, channel type, time slot, sub-channel number, etc.); the MS power; the cell identifier; and the TA. If frequency hopping is used, the U-TDOA Response message also includes the frequency list. The U-TDOA Response message also contains the ciphering key (Kc) if ciphering is used on the air interface and the version of the applied A5 ciphering algorithm (A5/x). The Kc is ciphered if sent from the SMLC to any LMU. The SMLC and any LMU with which it interacts shall also be mutually authenticated. These requirements shall be met using a security mechanism meeting the capabilities of the Zb interface of NDS/IP (TS 33.210) or TLS (RFC 2246). The LMU installation shall meet the same physical security requirements as a BTS installation. For locations on channels that are not ciphered, the algorithm identifier will show the same.

9.5.1.3 RR Procedure effecting the CS U-TDOA channel description

The location determination process is not an instantaneous event and it can take a few seconds to collect and calculate location determination related data. If changes happen to the last reported channel description and the location determination is not complete, an updated channel description needs to be sent to the SMLC.

The BSC considers the location determinations complete if; it receives a BSSAP-LE Perform Location response message; or the delta timer expires; or it receives a valid BSSLAP message for a new positioning method.

The RR procedures that effect the U-TDOA channel description are listed in Table 9.5.1. The "Treatment" column lists the appropriate BSSLAP message to be sent by the BSC to the SMLC. The Reset message is defined in 3GPP TS

48.071 and shall contain the updated channel description. After sending the Reset message the BSC shall restart the delta timer and continue supervision of the location request.

Table 9.5.1: RR Procedures affecting the CS U-TDOA channel description

RR Procedure in Dedicated Mode	Treatment	Comments
Channel assignment procedure.	Reset	
Handover procedures (intra-BSS).	Reset	For successful intra-BSS handover.
Frequency redefinition procedure.	Reset	Only meaningful in the case of frequency hopping.
Packet request procedure while in dedicated mode.	Reset	For DTM, when an existing CS connection is modified as PS resources are added in order to comply with MS frequency/time domain restrictions.
Packet downlink assignment while in dedicated mode	Reset	For DTM, when an existing CS connection is modified as PS resources are added in order to comply with MS frequency/time domain restrictions.
Channel mode modify	Reset	

If the BSC receives the BSSLAP U-TDOA Request message during one of the identified RR procedures in Table 9.5.1, it will complete the ongoing RR procedure and then respond with the BSSLAP U-TDOA Response message.

9.5.1.4 BSC Error Handling during CS U-TDOA Positioning Procedure

There are three (3) BSSLAP messages defined to handle error scenarios that occur during the U-TDOA location process: Reset, Reject and Abort. Please refer to 3GPP TS 48.071 for the messages' details. The BSSLAP Reset message is used to update the U-TDOA channel description as outlined in 9.5.1.3.

In Table 9.5.2, all identified RR procedures are listed that result in the BSSLAP Abort message to be sent from the BSC to the SMLC. The Abort message is only sent if the U-TDOA location determination is not complete. The BSC considers the location determinations complete if; it receives a BSSAP-LE Perform Location response message; or the delta timer expires; or it receives a valid BSSLAP message for a new positioning method.

Table 9.5.2: RR Procedures resulting in BSC Error Handling

RR Procedure in Dedicated Mode	Treatment
Handover procedure (inter-BSS).	Abort
Handover to UTRAN procedure.	Abort
Handover to CDMA2000 procedure.	Abort
RR connection release procedure.	Abort

If the BSC receives the BSSLAP U-TDOA Request message during one of the identified RR procedures in Table 9.5.2, it will respond with the BSSLAP Abort message.

If the BSC is unable to perform the U-TDOA positioning for other reasons than those related to the items listed in Table 9.5.1 and Table 9.5.2, it will respond to the BSSLAP U-TDOA Request message with the BSSLAP Reject message.

9.5.2 U-TDOA Positioning in PS Domain for A/Gb-mode

9.5.2.1 Introduction

The U-TDOA location method uses information transmitted by an MS to make a location determination. The initial state of the MS will be identified and will dictate the procedure to be followed in the location process. If the MS was in the packet transfer mode, sending uplink RLC/MAC blocks prior to the beginning of the location process, the energy associated with this continuing uplink data can be used to locate the MS. If the MS was previously idle in the uplink direction and placed in the active state by the SGSN specifically for U-TDOA location determination purposes, it is necessary to cause the MS to send uplink information using the Packet polling procedure (see 3GPP TS 44.060).

An uplink block of data containing the PACKET CONTROL ACKNOWLEDGEMENT message is equivalent to any other RLC/MAC block for U-TDOA location purposes; i.e. one uplink RLC/MAC block is equivalent to one execution of the Packet polling procedure. This applies only to the lowest numbered timeslot in the case of a multi-slot uplink TBF. The Polling Repetition information element in the U-TDOA Request message defines the total number of RLC/MAC uplink blocks required to achieve the desired location QoS within a recommended period of two seconds, including any PACKET CONTROL ACKNOWLEDGEMENT message received due to the execution of a Packet polling procedure.

9.5.2.2 General Procedures

The U-TDOA location method procedures depend on the initial condition of the MS. If the MS is initially in packet idle mode the Packet Polling method shall be applied as described in sub-clause 9.5.2.2.1. When the MS is initially in the packet transfer mode it may or may not be sending uplink data. If the MS is not sending uplink data the Packet polling procedure shall be applied. The application of the U-TDOA location method in the packet transfer mode is described in sub-clause 9.5.2.2.2.

9.5.2.2.1 MS in packet idle mode

For an MS that is in packet idle mode, application of the U-TDOA location method requires that a single timeslot downlink TBF be established. This downlink TBF shall be used for repeated executions of the Packet polling procedure in order to cause a mobile to transmit for a time sufficient to achieve the requested level of location accuracy. The number of repetitions of the Packet polling procedure required to achieve the desired level of accuracy shall be indicated in the U-TDOA REQUEST message sent from the SMLC to the BSS.

The BSS shall execute the indicated number of Packet polling procedures after an implementation dependent interval to allow assignment of the Location Measurement Units (LMU) to the indicated ARFCN and timeslot(s). The RRBP field shall be used to schedule the resulting PACKET CONTROL ACKNOWLEDGEMENT messages. The BSS must indicate a PACKET CONTROL ACKNOWLEDGEMENT response containing the TLLI by setting the TYPE OF ACK information element to RLC/MAC control block in all PACKET POLLING REQUEST messages associated with U-TDOA positioning.

If the MS is allocated an uplink TBF prior to completion of the required number of Packet polling procedures, the BSS may suspend the Packet polling procedure and send a Reset message to the SMLC containing the physical channel information for the allocated uplink TBF. Following sending of a Reset message, the BSS shall reset the Polling Repetition counter to zero and restart the U-TDOA positioning procedure after an implementation dependent interval.

The downlink TBF established for U-TDOA location purposes should be used if a single timeslot downlink TBF is required during the execution of the U-TDOA location procedure. If a multi-slot downlink TBF is required during the execution of the U-TDOA location procedure, the assignment of this TBF may be delayed until the completion of the U-TDOA location procedure, otherwise the BSS shall send a Reset message to the SMLC and reset the Polling Repetition counter as described previously.

If both an uplink TBF and a downlink TBF are required during the execution of the U-TDOA location procedure, the Packet polling procedure may be restarted and the uplink RLC/MAC blocks can be used for U-TDOA location as described subsequently.

9.5.2.2.2 MS in packet transfer mode

If only a downlink TBF exists it shall be used to execute the Packet polling procedure, on the lowest numbered timeslot transmitted before the last PACKET POLLING REQUEST/PACKET CONTROL ACKNOWLEDGEMENT cycle has

been completed, the BSS shall not set the FBI bit in the RLC/MAC header of the last data block. The TBF shall be terminated after the last cycle of the Packet polling procedure using a PACKET TBF RELEASE message from the BSS. If the MS is allocated an uplink TBF prior to completion of the required number of Packet polling procedures, the BSS may suspend the Packet polling procedure and send a Reset message to the SMLC as described in sub-clause 9.5.2.2.1.

If only an uplink TBF exists and RLC/MAC blocks are available for transmission (on the lowest numbered timeslot for a multi-slot TBF), those blocks shall be used to locate the MS using the U-TDOA location method. If the number of uplink blocks pertaining to the uplink TBF is insufficient to satisfy the requested number of uplink data blocks within an implementation dependent period, the Packet polling procedure shall be executed on the existing uplink TBF for the balance of the requested blocks. The lowest numbered timeslot shall be used for the Packet polling procedure if the existing uplink TBF is a multi-slot TBF. The uplink TBF shall not be terminated until the Packet polling procedures have been completed.

If both an uplink and downlink TBF exist, either TBF may be used for MS location using the U-TDOA location method as described previously. The TBF should not be terminated until the Packet polling procedures have been completed.

9.5.2.3 PS U-TDOA Messages and Procedures on the Lb Interface

The following section describes the positioning procedure for PS U-TDOA location determination on the Lb interface.

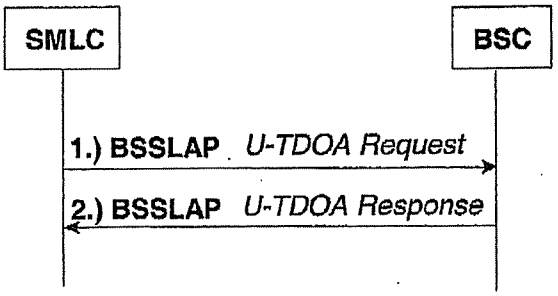

Figure 37: PS U-TDOA Positioning Procedure

1. The SMLC sends a BSSMAP-LE Connection Oriented Information message to the BSS that contains the embedded BSSLAP U-TDOA Request message. The U-TDOA Request message contains the required number of received uplink RLC/MAC blocks, repetitions of the RLC/MAC Packet polling request procedure or combination of both. The inclusion of this Polling Repetition information element in the U-TDOA Request message indicates that the location determination shall occur in the PS domain.

2. The BSS sends a BSSMAP-LE Connection Oriented Information message to the SMLC that contains the embedded BSSLAP U-TDOA Response message. The U-TDOA Response message contains; the physical channel information (frequencies, time slot, TFI, TLLI, start time, etc.); the MS power; the cell identifier; and the Timing Advance. For MS without an existing uplink or downlink TBF the BSS establishes a downlink TBF, if one does not currently exist. The BSS monitors any uplink TBF until the requested number of RLC/MAC blocks has been received, executes the specified number of Packet polling procedures on the lowest numbered timeslot in the case of a multi-slot TBF or a combination of both as described in sub-clause 9.5.2.1. The BSS releases any downlink TBF established solely for U-TDOA location.

9.5.2.4 RLC/MAC Procedure affecting the PS U-TDOA TBF description

The RLC/MAC procedures that effect the U-TDOA channel description are listed in Table 9.5.3. The "Treatment" column lists the message to be sent by the BSS to the SMLC. The Reset message is defined in 3GPP TS 48.071 and shall contain the updated channel description. After sending the Reset message the BSS shall wait for an implementation dependent interval to allow reconfiguration of the LMUs, start the U-TDOA location process from the beginning and continue supervision of the location request.

Table 9.5.3: RLC/MAC Procedures affecting the PS U-TDOA channel description

RLC/MAC Procedure	Treatment	Comments

Packet Timeslot Reconfigure	Reset	
Packet Access Reject	Reset	Access retry cases
Cell Reselection	Reset	MS originated (intra-BSS)
Packet Cell Change Order	Reset	Network originated (intra-BSS)

If the BSS receives the BSSLAP U-TDOA Request message during one of the identified RLC/MAC procedures in Table 9.5.3, it will complete the ongoing RLC/MAC procedure and then respond with the BSSLAP U-TDOA Response message. The Reset message must be sent after completion of the listed RLC/MAC procedure if that procedure must be executed during an ongoing U-TDOA location event.

9.5.2.5 Error Handling during PS U-TDOA Positioning Procedure

In Table 9.5.4, all identified RLC/MAC procedures are listed that result in the BSSLAP Abort message to be sent from the BSS to the SMLC. The Abort message is only sent if the U-TDOA location determination is not complete. The BSS considers the location determinations complete if; it receives a BSSAP-LE Perform Location response message; or it receives a valid BSSLAP message for a new positioning method.

Table 9.5.4: RLC/MAC Procedures resulting in Error Handling

RLC/MAC Procedure	Treatment	Comments
Cell Reselection	Abort	MS originated (inter-BSS)
Packet Cell Change Order	Abort	Network originated (inter-BSS)
Packet Pause	Abort	
Packet Access Reject	Abort	Cases without access retry indication

If the BSS is unable to perform the U-TDOA positioning for other reasons than those related to the items listed in Table 9.5.3 and Table 9.5.4, it will respond to the BSSLAP U-TDOA Request message with the BSSLAP Reject message.

10 Information storage

This clause describes information storage structures that are mandatory (M), conditional (C) or optional (O) for LCS in GERAN, and the recovery and restoration procedures needed to maintain service if inconsistencies in databases occur and for lost or invalid database information.

10.1 SMLC

Common Data

Table 2 holds permanent BTS data:

Table 2: Permanent SMLC Data for a BTS

Permanent BTS Data Item	Status	Description
BTS position	M	BTS position (latitude/longitude) of the Serving BTS
CGI	M	Cell global identity.
BSIC	M	Base station identity code.
BCCH	M	Frequency of the broadcast carrier.

ETSI TS 123 108 V6.0.0 (2004-12)

Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Universal Mobile Telecommunications System (UMTS);
Mobile radio interface layer 3 specification
core network protocols;
Stage 2 (structured procedures)
(3GPP TS 23.108 version 6.0.0 Release 6)**

Reference
RTS/TSGN-0123108v600

Keywords
GSM, UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The present document specifies the procedures used at the radio interface core network protocols within the 3rd generation mobile telecommunications system and the digital cellular telecommunications system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

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  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document includes references to features which are not part of the Phase 2+ Release 96 of the GSM Technical specifications. All subclauses which were changed as a result of these features contain a marker (see table below) relevant to the particular feature.

1 Scope

The present document specifies the procedures used at the radio interface (Reference Point Um, see 3GPP TS 24.002) for Call Control (CC), Mobility Management (MM), and Session Management (SM).

When the notations for "further study" or "FS" or "FFS" are present in the present document they mean that the indicated text is not a normative portion of this standard.

These procedures are defined in terms of messages exchanged over the control channels of the radio interface. The control channels are described in 3GPP TS 44.003.

The structured functions and procedures of this protocol and the relationship with other layers and entities are described in general terms in 3GPP TS 24.007.

1.1 Scope of the Technical Specification

The procedures currently described in the present document are for the call control of circuit-switched connections, session management for GPRS services, mobility management and radio resource management for circuit-switched and GPRS services.

3GPP TS 24.010 contains functional procedures for support of supplementary services.

3GPP TS 24.011 contains functional procedures for support of point-to-point short message services.

3GPP TS 24.012 contains functional description of short message - cell broadcast.

3GPP TS 44.060 contains procedures for radio link control and medium access control (RLC/MAC) of packet data physical channels.

3GPP TS 44.018 contains the procedures for the RR protocol.

3GPP TS 24.008 contains the procedures for the CN protocols.

3GPP TS 44.071 contains functional descriptions and procedures for support of location services.

NOTE: "layer 3" includes the functions and protocols described in this Technical Specification. The terms "data link layer" and "layer 2" are used interchangeably to refer to the layer immediately below layer 3.

1.2 Application to the interface structures

The layer 3 procedures apply to the interface structures defined in 3GPP TS 44.003. They use the functions and services provided by layer 2 defined in 3GPP TS 44.005 and 3GPP TS 44.006. 3GPP TS 24.007 gives the general description of layer 3 including procedures, messages format and error handling.

1.3 Structure of layer 3 procedures

A building block method is used to describe the layer 3 procedures.

The basic building blocks are "elementary procedures" provided by the protocol control entities of the three sublayers, i.e. radio resource management, mobility management and connection management sublayer.

Complete layer 3 transactions consist of specific sequences of elementary procedures. The term "structured procedure" is used for these sequences.

1.4 Test procedures

Test procedures of the GSM radio interface signalling are described in 3GPP TS 51.010 and 3GPP TS 51.02x series.

7.3 Selected examples

The following examples are considered:

- location updating;
- mobile originating call establishment;
  a) without OACSU (early assignment);
  b) with OACSU;
  c) with very early assignment;
- mobile terminating call establishment;
  a) without OACSU (early assignment);
  b) with OACSU;
- call clearing:
  a) network initiated;
  b) mobile initiated;
- DTMF protocol control.
- handover:
  a) between finely synchronized cells;
  b) between non-synchronized cells;
  c) handover failure, where reconnection of the old channel is possible;
- in-call modification;
- call re-establishment;
- network initiated MO call, e.g. CCBS Recall $(CCBS)$:
  a) assignment before A party alerting;
  b) assignment before B party alerting;
  c) assignment after A and B party alerting.

7.3.1 Location updating

The location updating procedure is always initiated by the mobile station e.g. when it finds itself in a different location area from the one in which it was registered before. The cases where the procedure is triggered are described in clause 4.

The procedure is shown in figure 7.9/3GPP TS 23.108. The network may decide whether to allocate a new TMSI during location updating, and this option is reflected in this example.

The mobile station initiates immediate assignment, service request using the LOCATION UPDATING REQUEST message, and contention resolution.

The network requires authentication (this again is an option).

As the network intends to allocate a new TMSI, it should activate ciphering. The network includes the new TMSI in the LOCATION UPDATING ACCEPT message (it could also use the explicit TMSI reallocation procedure, see clause 4). The mobile station sends a TMSI REALLOCATION COMPLETE message to the network to acknowledge the receipt

of the new TMSI. Upon receipt of the TMSI REALLOCATION COMPLETE message the network initiates the channel release if no further transactions are scheduled.

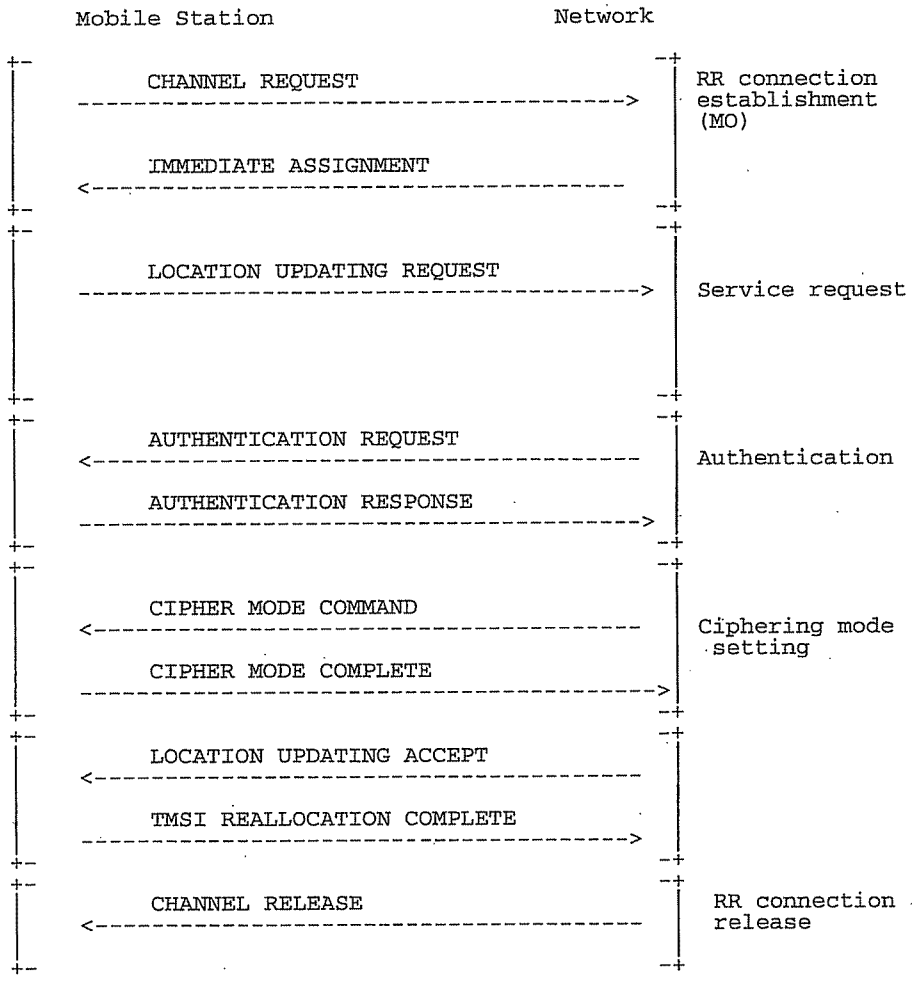

Figure 7.9/3GPP TS 23.108: Location updating: successful case

7.3.2 Mobile originating call establishment

The mobile station initiates immediate assignment, service request using the CM SERVICE REQUEST message, and contention resolution. The network may initiate authentication and may start the ciphering mode setting.

After sending the CIPHERING MODE COMPLETE message, the mobile station initiates call establishment by sending the SETUP message to the network. The network answers with a CALL PROCEEDING message.

a) Non-OACSU option (early assignment):

With this option the network allocates a traffic channel to the mobile station before it initiates call establishment in the fixed network.

If call queuing is applied, it may cause variable delay in the traffic channel assignment.

When user alerting has been initiated at the called side, an ALERTING message is sent to the mobile station. The network may optionally instruct the MS to attach the user connection at this stage of the call, by means of the progress indicator information element set to the value #1 or #8 (if the ringing tone will be sent by the remote end) in the ALERTING message. In that case, an alerting ringing tone has to be generated by the network.

NOTE: The speech codec is transparent for supervisory tones.

A CONNECT message and its acknowledgement CONNECT ACKNOWLEDGE complete the call establishment when the called party has answered.

The mobile originating call setup with early assignment is shown in figure 7.10a/3GPP TS 23.108.

b) OACSU option (late assignment):

The network determines when the traffic channel is to be assigned. The assignment may be performed at any time after call establishment has been initiated in the fixed network. In the following the case is considered where the network will only allocate a traffic channel after the called party has answered the call (late assignment).

As in a) an ALERTING message is sent to the mobile station when user alerting has been initiated at the called side. If the ringing tone is needed, it has to be generated locally at the mobile station as no traffic channel is allocated. When the called party has answered, the network will initiate the channel assignment procedure in order to allocate a traffic channel to the mobile station. If call queuing is applied, it may cause variable delay in the traffic channel assignment. Once the channel assignment has been completed the network will send a CONNECT message to the mobile station. The MS attaches then the user connection. The CONNECT ACKNOWLEDGE message will complete the call setup.

The mobile originating call setup with late assignment is shown in figure 7.10b/3GPP TS 23.108.

c) Very early assignment:

The network assigns the traffic channel at the earliest possible moment, i.e. in the immediate assignment procedure. The mode of the traffic channel is changed from signalling only to the mode necessary for the call by means of the channel mode change procedure. An appropriate moment for that change is after the network has sent the CALL PROCEEDING message, when the call is established towards the called user.

With this option, call queuing is never applied.

The further establishment of the call is as in a).

The mobile originating call setup with very early assignment is shown in figure 7.10c/3GPP TS 23.108.

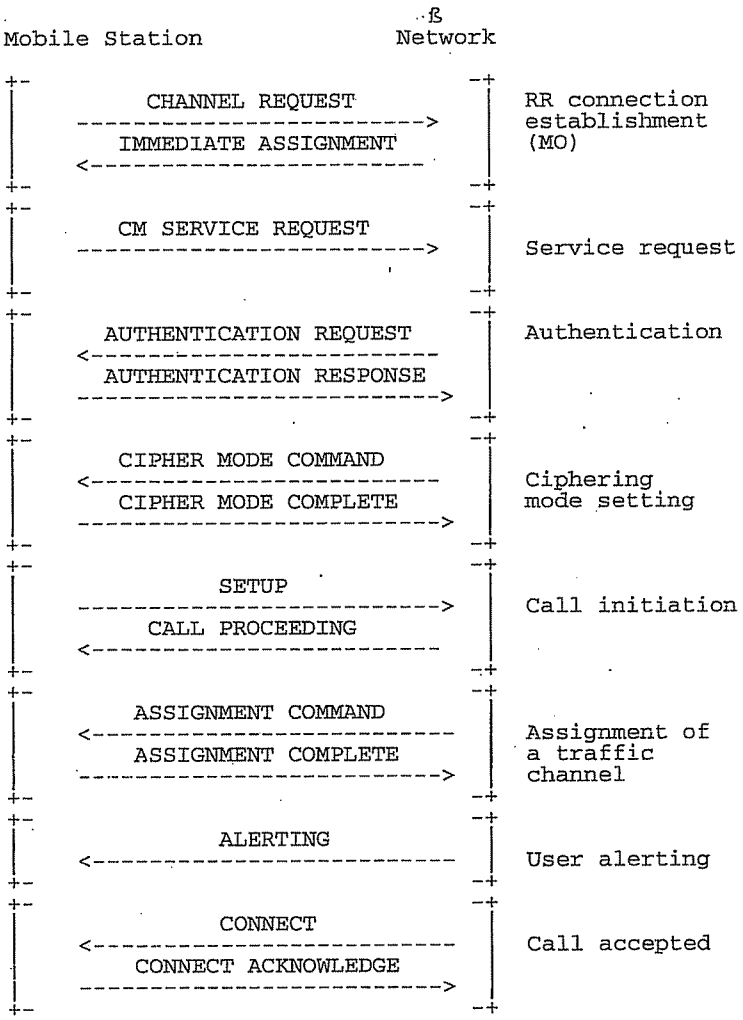

Figure 7.10a/3GPP TS 23.108: Mobile originating call establishment without OACSU (early assignment)

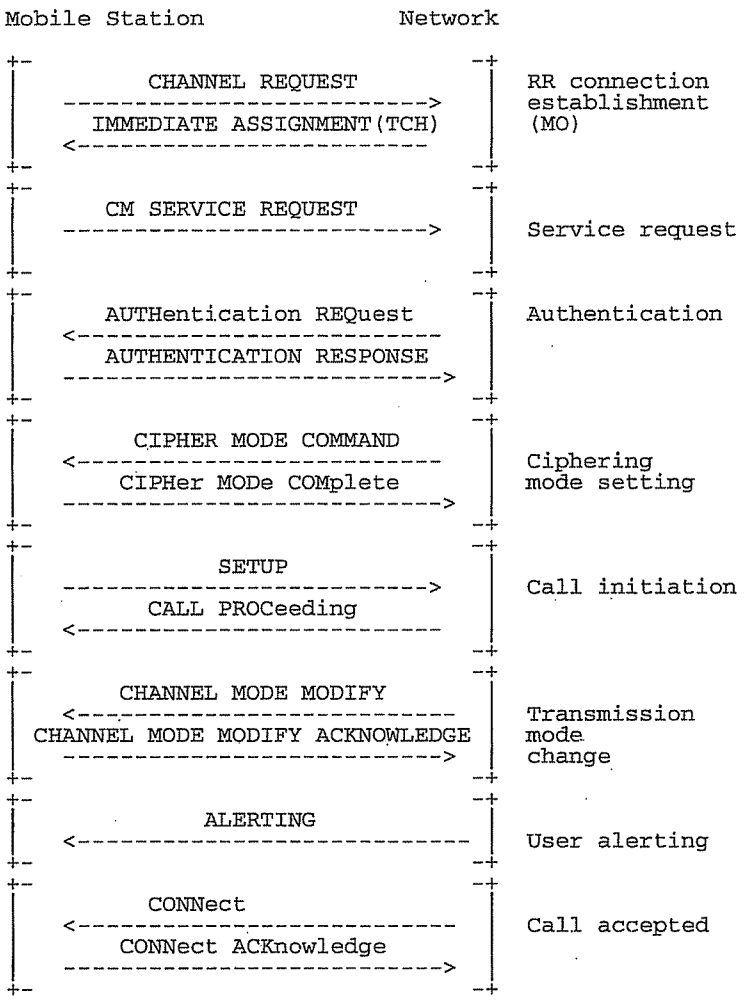

Figure 7.10c/3GPP TS 23.108: Mobile originating call establishment with very early assignment

7.3.3 Mobile terminating call establishment

Mobile terminating call establishment is initiated by the network sending a PAGING REQUEST message (see figure 7.11a/3GPP TS 23.108). Upon receiving this message the mobile station initiates the immediate assignment procedure and responds to the network by sending the PAGING RESPONSE message within a layer 2 SABM frame. The network returns a layer 2 UA frame containing the same information field as was sent in the SABM frame.

Authentication and ciphering are treated by the network in the same way as defined for the mobile originating call establishment (subclause 7.3.2). After ciphering has been started, the network sends a SETUP message to the mobile station. The capability of the mobile station (at that time) to accept the call is confirmed when the mobile station returns a CALL CONFIRMED message to the network.

a) Non-OACSU option (early assignment):

With this option the network initiates the assignment of a traffic channel upon receiving the CALL CONFIRMED message.

The signal IE is not included in the SETUP message, therefore user alerting is initiated only after a traffic channel has been allocated. An ALERTING message will be sent to the network.

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When the called user answers, the mobile station sends a CONNECT message to the network. Upon receiving the CONNECT message the network completes the through connection of the communication path and sends a CONNECT ACK message to the mobile station.

b) OACSU option (late assignment):

In that option, the signalling IE is included in the SETUP message. Consequently, user alerting is initiated as soon as the MS has accepted the call.

The network determines when the traffic channel is to be assigned. The assignment may be performed at any time after user alerting has been initiated. In the following the case is considered where the network will only allocate a traffic channel to the mobile station after having received the CONNECT message sent from the mobile station (see figure 7.11b).

Upon receiving the ASSIGNMENT COMPLETE message from the mobile station, the network completes the through connection of the communication path and sends a CONNECT ACKNOWLEDGE message to the mobile station.

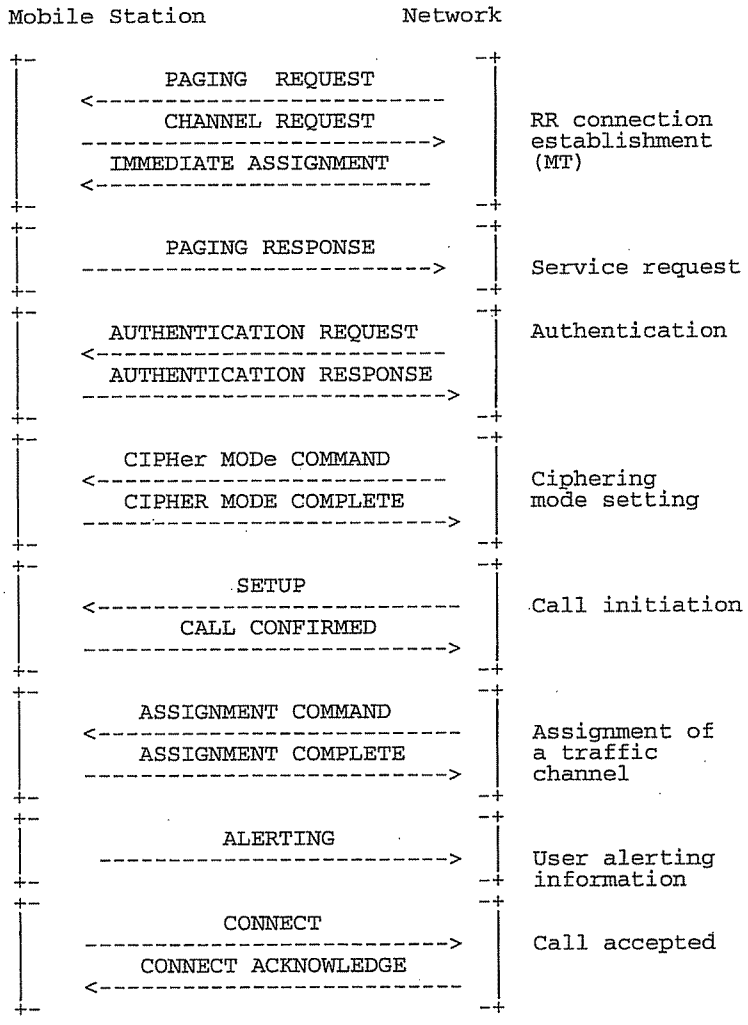

Figure 7.11a/3GPP TS 23.108: Mobile terminating: call establishment without OACSU (early assignment)

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TRUEPOSITION INC.,	)	
	)	
PLAINTIFF/	)	
COUNTERCLAIM- DEFENDANT,	)	
	)	
	)	
v.	)	**CIVIL ACTION NO. 05-00747-SLR**
	)	
ANDREW CORPORATION,	)	
	)	
DEFENDANT/	)	
COUNTERCLAIM-PLAINTIFF.	)	

ANDREW CORPORATION'S SUPPLEMENTAL RESPONSES TO TRUEPOSITION'S FIRST SET OF INTERROGATORIES

Pursuant to Rules 26(e) and 33 of the Federal Rules of Civil Procedure, Andrew Corporation hereby supplements its responses to TruePosition's First Set of Interrogatories. Pursuant to Rule 26(e) of the Federal Rules of Civil Procedure, Andrew expressly reserves the right to supplement these responses further.

Interrogatory No. 1

Identify by name, trade designation. and/or model number. each line, type, or version of Cellular Telephone Location System, or component thereof, made, used. sold, or offered for sale in or from the United States, or imported into the United States, by Andrew since January 1, 2004, and identify, separately, the Person most knowledgeable at Andrew with respect to such manufacture, use, sale, offer for sale, and/or importation of each identified Cellular Telephone Location System or component, and the Person most knowledgeable at Andrew with respect to the U-TDOA functionality of each identified Cellular Telephone Location System or component.

on the cellular system's control channel. As explained above, Andrew's accused products will locate cellular phones on the cellular system's voice/traffic channel and have no control over the type of signal that is received and used in locating the phone. Nor does Andrew instruct or encourage anyone to use any specific type of channel to locate cellular phones.

B. Andrew's accused products also lack many other limitations of the '144 Patent claims, including without limitation, the "means for processing said frames of data," "means for determining" and "reverse control channels" required by claims 1-21, the "locating means for automatically determining," the "database means" and "reverse control channels" required by claims 22-30, and the "processing said signals at each cell site to produce frames of data," "determining" and "reverse control channels" required by claims 31-45.

* * *

Andrew reserves the right to supplement and/or amend its answer to this interrogatory once additional facts are known, TruePosition provides its infringement contentions and after the Court issues its claim construction order.

Interrogatory No. 4

Describe in detail the circumstances under which Andrew first became aware of the '144 Patent, including the exact date of Andrew's first awareness, the Person(s) at Andrew who became aware of the '144 Patent, the manner in which that Person(s) became aware of the '144 Patent, and what that Person(s) did, if anything, upon becoming aware of the '144 Patent, including the name(s) of any other Person(s) told about the '144 Patent and the date(s) such other Person(s) was told about the '144 Patent.

Response:

Andrew objects to this interrogatory on the grounds that "Andrew's first awareness" and Andrew first became aware" are vague and ambiguous phrases.

Subject to and without waiving its specific objections and General Objections, Andrew states that its current belief based on reasonable investigation (and without exhaustively

determining the earliest knowledge of the '144 Patent of every Andrew employee), is that the earliest time an Andrew employee had personal knowledge of the existence and basic substance of the '144 Patent was in July 2003, when Joseph P. Kennedy became an Andrew employee. Mr. Kennedy first learned of the existence of the '144 Patent shortly after it was granted — and before he was employed by Andrew — as a result of TruePosition's publicizing the patent. In July 2003, Mr. Kennedy had discussions with others at Andrew about TruePosition's patent portfolio generally, but he does not recall discussing the '144 Patent in particular at that time.

Andrew is still in the process of conducting its inquiry into the facts and circumstances at issue in the present litigation and reserves the right to continue to supplement its response to this Interrogatory as the litigation progresses.

Interrogatory No. 5

State the factual basis for denying, in paragraph 24 of Andrew's Answer, that Andrew has willfully and deliberately infringed the '144 Patent.

Response:

Subject to and without waiving its General Objections, Andrew states it has not infringed the '144 Patent, willfully or otherwise, for the reasons stated in its response to Interrogatory No. 3. Andrew incorporates that response by reference. Andrew reiterates the claims and prosecution history of the '144 Patent are crystal clear that the '144 Patent claims require mobile cellular phones to be located by monitoring the phones' periodic control channel transmissions. Andrew's accused products do not monitor cellular phones' periodic transmissions, do not locate mobile cellular phones through monitoring the phones' periodic transmissions, and do not satisfy many other limitations of the '144 Patent claims, as explained in Andrew's response to Interrogatory No. 3. Moreover, Andrew's products will have a substantial non-infringing use

regardless of how TruePosition tries to interpret the '144 Patent claims, as also explained in Andrew's response to Interrogatory No. 3.

Andrew reserves the right to supplement and/or amend its response to this interrogatory once additional facts are known and as the litigation progresses.

Interrogatory No. 6

State whether Andrew received any legal advice, written or oral, relating to the '144 Patent, the date(s) the advice was received, the author(s) of the advice, the recipient(s) of the advice, any Person(s) at Andrew other than the recipient(s) told of or who received a copy of the advice, the date(s) when Person(s) at Andrew other than the recipient(s) were told or received a copy of the advice, whether Andrew relied on such advice to engage in, or refrain from engaging in, any business activity(ies), including whether Andrew relied on the advice in bidding on the RFP issued by STC referred to in Andrew's Answer, the business activity(ies) that Andrew engaged in, or refrained from engaging in, in reliance on the advice, and the substance of all the advice received.

Response:

Subject to and without waiving its General Objections, Andrew states that, except for advice from in-house attorneys, litigation counsel and its regular outside patent counsel, it has not received any legal advice relating to the '144 Patent. Andrew further states the Scheduling Order sets a date of September 8, 2006 for Andrew to disclose whether it intends to rely on an opinion of counsel defense and produce documents pertaining to that defense.

Interrogatory No. 7

State the factual basis for the allegations in the First Affirmative Defense and paragraph 9 in the Counterclaims section of Andrew's Answer that the '144 Patent and each of its claims are invalid and/or unenforceable under one or more sections of Title 35 of the United States Code, including §§ 101, 102, 103, and/or 112," including the identity of each section of Title 35 of the United States Code under which the '144 Patent and each of its claims are allegedly invalid and/or unenforceable, which claims of the '144 Patent are allegedly invalid and/or unenforceable under each section of Title 35 identified, the prior art, if any, that allegedly renders each claim of the '144 Patent invalid and/or unenforceable under each section of Title 35 identified, and how such prior art allegedly renders each claim of the '144 Patent invalid and/or unenforceable under each section of Title 35 identified.

Response:

Subject to and without waiving the foregoing general objections, Andrew states that: (i) each claim of the '144 Patent is invalid either as anticipated under 35 U.S.C. § 102 or as obvious under 35 U.S.C. § 103 in light of prior art included in the documents Andrew produces in response to TruePosition's document requests; and (ii) each claim of the '144 Patent is invalid under 35 U.S.C. § 112 due to lack of enabling disclosure.

Andrew is still in the process of conducting its inquiry into the facts and circumstances at issue in the present litigation and reserves the right to continue to supplement its response to this interrogatory as the litigation progresses.

Interrogatory No. 8

State the factual basis for the allegation in the Third Affirmative Defense of Andrew's Answer that "TruePosition is barred from maintaining its claims for infringement by the defense of equitable estoppel."

Response:

Subject to and without waiving its General Objections, Andrew states:

The European Telecommunications Standards Institute ("ETSI") IPR Policy imposes an obligation for each member to use its reasonable efforts to timely inform ETSI of essential IPR that it becomes aware of. The ETSI IPR Policy imposes an additional obligation on any member who submits a technical proposal for a standard or a technical specification to inform ETSI of its ownership of any IPR which might be an Essential IPR if that proposal is adopted. An IPR is an "Essential IPR" under ETSI's IPR Policy if it is not possible on technical grounds to implement the standard without infringing that IPR.

TruePosition is, and has been at all relevant times, a member of ETSI. Through its membership, TruePosition has agreed to comply with ETSI's IPR Policy.

TruePosition, Andrew and others collectively submitted various proposals requesting the adoption of a standard for locating mobile phones which used Uplink Time Difference of Arrival ("U-TDOA"). The proposals submitted were governed by ETSI's IPR Policy.

At the time TruePosition submitted standards proposals regarding U-TDOA, TruePosition was aware of the '144 Patent. TruePosition also was aware of its obligations to disclose Essential IPR to ETSI. For example, when submitting a "Draft U-TDOA GPRS Feasibility Study" in March 2002, TruePosition represented to ETSI that it may hold patents or copyrights that cover information contained in the submission but would license them under reasonable, non-discriminatory terms and conditions:

> TruePosition, Incorporated may hold one or more patents or copyrights that cover information contained in this document. A license will be made available to applicants under reasonable terms and conditions that are demonstrably free of any unfair discrimination.

TPI_E0000157.

TruePosition never declared the '144 Patent as Essential IPR to ETSI. TruePosition never told ETSI or any ETSI member that TruePosition would assert the '144 Patent against entities practicing U-TDOA or would refuse to license the '144 Patent to those entities on reasonable non-discriminatory terms and conditions, even though TruePosition considered the proposed U-TDOA standard to be within the scope of one or more of its patents.

TruePosition had numerous opportunities to tell ETSI and its members, including Andrew, that TruePosition would assert the '144 Patent against them. For example, TruePosition could have declared the '144 Patent (or at a minimum told ETSI and its members that TruePosition would assert the '144 Patent against U-TDOA applications) at any of the following meetings held in California, USA:

- On August 26-30, 2002, 3GPP TSG GERAN meeting #11 occurred in Los Angeles, California. Bob Gross and Rhys Robinson attended as TruePosition's representatives. At this meeting, TruePosition proposed a Work Item entitled, "Uplink TDOA location determination for GSM/GPRS; Proposed Rel-6 Work Item." The work item proposed included U-TDOA as a GSM/GPRS location method in the Release 6 specifications. *See* TPI_E0000008. But during this entire 5-day meeting, TruePosition never disclosed the '144 Patent, never declared that it considered the '144 Patent to be Essential IPR and never said it would assert the '144 Patent against any entity practicing U-TDOA.

- On May 19-23, 2003, a 3GPP TSG GERAN meeting was held in San Diego, California. Bob Gross again represented TruePosition at the meeting, and proposed at least one change request involving inclusion of U-TDOA designators in the Positioning Data information element. *See* TPI-E0000052. Here again, during this entire 5-day meeting, TruePosition never disclosed the '144 Patent, never declared that it considered the '144 Patent to be Essential IPR and never said it would assert the '144 Patent against any entity practicing U-TDOA.

- On September 7-9, 2004, 3GPP TSG GERAN meeting #25 was held in Palm Springs, California. Bob Gross was again in attendance representing TruePosition. At that meeting, Mr. Gross presented a proposal titled, "Inclusion of Uplink TDOA UE positioning method in the UTRAN specifications." *See* TPI-E0000223. Here again, during this entire 3-day meeting, TruePosition never disclosed the '144 Patent, never declared that it considered the '144 Patent to be Essential IPR and never said it would assert the '144 Patent against any entity practicing U-TDOA.

TruePosition had numerous other opportunities to inform ETSI and its members that TruePosition would assert the '144 Patent against entities practicing U-TDOA, including without

limitation at 3GPP meetings held in August 2001, November 2001, March 2002, April 2002, November 2002, January 2003, February 2003, March 2003, April 2003, June 2003, August 2003, October 2003, November 2003, January 2004, February 2004, March 2004, April 2004, June 2004, August 2004, October 2004 and November 2004. *See, e.g.*, TPI-E0000151, TPI-E0000153, TPI-E0000157, TPI-E0000161, TPI-E0000009, TPI-E0000014, TPI-E0000019, TPI-E0000029, TPI-E0000037, TPI-E0000057, TPI-E0000065, TPI-E0000068, TPI-E0000075, TPI-E0000084, TPI-E0000118, TPI-E0000110, TPI-E0000122, TPI-E0000131, TPI-E0000135, TPI-E0000139, TPI-E0000144. But despite these opportunities, TruePosition never declared the '144 Patent or any other intellectual property as Essential IPR. TruePosition never told ETSI or any ETSI member, including Andrew, that TruePosition would assert the '144 Patent against them for practicing U-TDOA.

Instead, as recently as May 2004, TruePosition continued to lead Andrew to believe Andrew would not be sued under any allegedly essential patents TruePosition owns or controls. For example, in responding to Andrew's request regarding intellectual property held by TruePosition, Bob Gross, TruePosition's 3GPP representative, stated in a May 26, 2004 email:

> The Patent lawyer indicates that we do have blocking IP (he'll e-mail me the Patent #) that applies to CDMA systems and that we will declare it at the appropriate time (whatever that means). If I understand the terms of the settlement between our two organizations, you have access to this IP without any licensing fees.

AND_EF005403.

Andrew justifiably relied that TruePosition would comply with the letter and spirit of ETSI's IPR Policy. When Andrew bid to supply services and/or equipment implementing U-TDOA, Andrew further justifiably relied on TruePosition's misrepresentations (by silence and

otherwise) that TruePosition would not assert the '144 Patent against entities practicing U-TDOA.

Under these circumstances, TruePosition is equitably estopped from now alleging Andrew infringes the '144 Patent.

Andrew also incorporates by reference the allegations pled in paragraphs 1-56 of its Counterclaim. Andrew reserves the right to supplement and/or amend its response to this interrogatory once additional facts are known and as the litigation progresses.

Interrogatory No. 9

State the factual basis for the allegation in the Fourth Affirmative Defense of Andrew's Answer that "TruePosition is not entitled to any relief by reason of its coming into this Court with unclean hands."

Response:

Subject to and without waiving its General Objections, Andrew states:

The European Telecommunications Standards Institute ("ETSI") IPR Policy imposes an obligation for each member to use its reasonable efforts to timely inform ETSI of essential IPR that it becomes aware of. The ETSI IPR Policy imposes an additional obligation on any member who submits a technical proposal for a standard or a technical specification to inform ETSI of its ownership of any IPR which might be an Essential IPR if that proposal is adopted. An IPR is an "Essential IPR" under ETSI's IPR Policy if it is not possible on technical grounds to implement the standard without infringing that IPR.

TruePosition is, and has been at all relevant times, a member of ETSI. Through its membership, TruePosition has agreed to comply with ETSI's IPR Policy.

Andrew also incorporates by reference the allegations pled in paragraphs 1-56 of its Counterclaim. Andrew reserves the right to supplement and/or amend its response to this interrogatory once additional facts are known and as the litigation progresses.

Interrogatory No. 10

Describe in detail the circumstances under which "Andrew with others" jointly "submitted proposals to 3GPP requesting the adoption of a standard for locating mobile phones which used Uplink Time Difference of Arrival ('U-TDOA')" as alleged in paragraph 18 of the Counterclaims section of Andrew's Answer, including the title and/or identifier of each alleged proposal jointly submitted to 3GPP, the exact date(s) each alleged proposal was jointly submitted to 3GPP, the exact group(s), subgroup(s), and/or committee(s) within 3GPP that each alleged proposal was jointly submitted to, the Person(s) who were involved with submitting each of the alleged proposals on Andrew's behalf the Person(s) who were involved in negotiating and/or preparing each of the alleged proposals on Andrew's behalf, the Business Entity(ies) and Person(s), whether or not associated with Andrew, that actually drafted or prepared any portion of each alleged proposal, and the exact date that 3GPP allegedly "adopted" each of the alleged proposals as alleged in paragraph 20 of the Counterclaims section of Andrew's Answer.

Response:

Andrew objects to this Interrogatory on the grounds that it is vague and ambiguous.

Subject to and without waiving its General Objections and specific objections, the documents Andrew produces in response to TruePosition's document requests will include the proposals referred to in paragraph 18 of the Counterclaims section of Andrew's Answer and will identify the Peron(s) from Andrew involved with submitting, negotiating and/or preparing the proposals, the Business Entity(ies) and Person(s) that drafted or prepared any portion of each proposal to the extent that is known by Andrew, and the date that 3GPP adopted each proposal. *See, e.g.*, documents bearing production numbers AND_EF0005291-6308.

Interrogatory No. 11

If Andrew's response to either Request No. 47 or Request No. 48 of True Position's First Set of Requests for Admission to Andrew Corporation (Nos. I-58) is anything other than an unqualified admission, then state whether Andrew contends that the '144 Patent is Essential IPR, under ETSI's IPR Policy, with respect to the "UTDOA standards" referenced in paragraph 21 of

the Counterclaims section of Andrew's Answer, and if so, the factual basis for such contention, including the identification, by date or otherwise, of the relevant ETSI IPR Policy, the production numbers of any copy(ies) of ETSI's IPR Policy(ies) produced by Andrew, the specific section(s) of ETSI's IPR Policy that allegedly render the '144 Patent, or the technology claimed by the '144 Patent, Essential IPR, why any identified section(s) of ETSI's IPR Policy(ies) allegedly renders the '144 Patent, or the technology claimed by the '144 Patent, Essential IPR, whether Andrew performed any analyses or studies of whether the '144 Patent, or the technology claimed in the '144 Patent, was Essential IPR under any ETSI IPR Policy prior to the filing of the Complaint in this action, and the production numbers for any such analyses or studies.

Response:

Andrew contends that if the claims of the '144 Patent are interpreted as Andrew understands TruePosition may be interpreting them, and broadly enough to encompass the geolocation products Andrew has contracted to supply to STC, then the '144 Patent is now, and was at the time TruePosition submitted the U-TDOA standards referenced in the Counterclaims section of Andrew's Answer, Essential IPR under ETSI's IPR Policy.

At the time TruePosition submitted the U-TDOA standards, the relevant ETSI IPR Policy was "Annex 6: ETSI INTELLECTUAL PROPERTY RIGHTS POLICY" to the ETSI Rules of Procedure, dated 22 November 2000. Sections 15.6 and 15.7 of that policy include definitions of "IPR" and "ESSENTIAL" as applied to IPR. If the claims of the '144 Patent are interpreted as Andrew understands TruePosition may be interpreting them, and broadly enough to encompass the geolocation products Andrew has contracted to supply to STC, then the '144 Patent was Essential IPR under that policy because it would not be possible, under that patent interpretation, on technical (but not commercial) grounds, taking into account normal technical practice and the state of the art generally available at the time of standardization, to make, sell, lease, otherwise dispose of, repair, use or operate EQUIPMENT (as that term is defined in section 15.4 of the ETSI IPR Policy) or METHODS (as that term is defined in section 15.5 of the ETSI IPR Policy)

which comply with a STANDARD (as that term is defined in section 15.11 of the ETSI IPR Policy) without infringing the '144 Patent.

The current ETSI IPR Policy is "Annex 6: ETSI Intellectual Property Rights Policy" to the ETSI Rules of Procedure, dated 23 November 2005. Sections 15.6 and 15.7 of that policy include definitions of "IPR" and "ESSENTIAL" as applied to IPR. If the claims of the '144 Patent are interpreted as Andrew understands TruePosition may be interpreting them, and broadly enough to encompass the geolocation products Andrew has contracted to supply to STC, then the '144 Patent is Essential IPR under that policy because it would not be possible, under that patent interpretation, on technical (but not commercial) grounds, taking into account normal technical practice and the state of the art generally available at the time of standardization, to make, sell, lease, otherwise dispose of, repair, use or operate EQUIPMENT (as that term is defined in section 15.4 of the ETSI IPR Policy) or METHODS (as that term is defined in section 15.5 of the ETSI IPR Policy) which comply with a STANDARD (as that term is defined in section 15.11 of the ETSI IPR Policy) without infringing the '144 Patent.

Andrew did not perform any formal analysis or study of whether the '144 Patent, or the technology claimed in the '144 Patent, was Essential IPR under any ETSI IPR Policy prior to the filing of the Complaint in this action.

Interrogatory No. 12

State the factual basis for the allegation in paragraph 25 of the Counterclaims section of Andrew's answer that "at the time that Andrew and TruePosition jointly proposed the U-TDOA standards to 3GPP, TruePosition knew or should have known that it was misrepresenting a material fact."

Response:

Subject to and without waiving its General Objections, Andrew states:

For example, in responding to Andrew's request regarding intellectual property held by TruePosition, Bob Gross, TruePosition's 3GPP representative, stated in a May 26, 2004 email:

> The Patent lawyer indicates that we do have blocking IP (he'll e-mail me the Patent #) that applies to CDMA systems and that we will declare it at the appropriate time (whatever that means). If I understand the terms of the settlement between our two organizations, you have access to this IP without any licensing fees.

AND_EF005403.

Andrew also incorporates by reference the allegations pled in paragraphs 1-56 of its Counterclaim. Andrew reserves the right to supplement and/or amend its response to this interrogatory once additional facts are known and as the litigation progresses.

Interrogatory No. 13

State the factual basis for the allegation in paragraph 27 of the Counterclaims section of Andrew's answer that "Andrew justifiably relied on TruePosition's misrepresentation of material fact in jointly submitting the U-TDOA standards, in urging their adoption by the members of ETSI, and in bidding to supply services and/or equipment implementing those standards."

Response:

Subject to and without waiving the foregoing general objections, Andrew states that the factual basis for this allegation is that Andrew jointly submitted the U-TDOA standards, urged their adoption by the members of ETSI, and bid to supply services and/or equipment implementing them based on its belief that, in light of the ETSI IPR Policy, no entity that was a contributor to the standards — including TruePosition — believed that sale of a system in compliance with the standards would infringe one of its patents and/or would assert a patent it did not disclose during the standards setting process.

Interrogatory No. 14

State the factual basis for the allegation in paragraph 29 of the Counterclaims section of Andrew's answer that "as a result of TruePosition's fraud, Andrew has suffered damages" and

provide a detailed a description of such alleged "damages," including whether Andrew is claiming that the attorneys fees, costs, and/or expenses associated with this case comprise all or any part of its alleged damages.

Response:

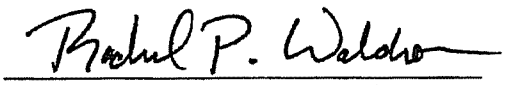
Subject to and without waiving the foregoing general objections, Andrew states that the factual basis for this allegation is that it may develop that Andrew has incurred costs in supplying and bidding to supply location equipment to Saudi Telecom Co. and in preparing and submitting 3GPP change requests concerning U-TDOA, and that Andrew has incurred costs in defending this suit, that would have been avoided but for TruePosition's fraud and other misconduct, and that Andrew faces a potential loss of profits from loss of other business opportunities as a result of TruePosition's fraud and other misconduct. The documents Andrew produces in response to TruePosition's document requests will include documents concerning these damages.

Andrew is still in the process of conducting its inquiry into the facts and circumstances at issue in the present litigation and reserves the right to continue to supplement its response to this Interrogatory as the litigation progresses.

Interrogatory No. 15

Explain in detail why Andrew decided to participate in the efforts to include Uplink Time Difference of Arrival (U-TDOA) as a means or method of locating mobile telephones or units in 3GPP and/or ETSI technical specifications or other deliverables, including whether Andrew's relationship with any Wireless Provider, including but not limited to AT&T Wireless and Cingular Wireless, and/or any other customer of Andrew, foreign or domestic, influenced or played any role in the decision to initially participate in such efforts, or to continue participating in such efforts, how any such relationship, individually, influenced or played a role in the decisions to initially participate or continue participating in such efforts, and state the substance of any communications between Andrew and such Wireless Provider and/or customer relating to the issue of whether Andrew should initially participate or continue participating in the efforts to include U-TDOA as a means or method of locating mobile telephones or units in 3GPP and/or ETSI technical specifications or other deliverables, including the date(s) on which such communications occurred and the Persons involved in such communications.

Dated: June 23, 2006



KIRKLAND & ELLIS LLP
John D. Desmarais
Citigroup Center
153 East 53rd Street
New York, New York 10022
(212) 446-4800

KIRKLAND & ELLIS LLP
Michael A. Parks
Rachel P. Waldron
Sarah J. Frey
200 East Randolph Drive
Chicago, IL 60601
(312) 861-2000

DUANE MORRIS LLP
Patrick D. McPherson
1667 K Street, N.W., Suite 700
Washington, DC 20006
(202) 776-7800

YOUNG CONAWAY STARGATT & TAYLOR, LLP
Josy Ingersoll
1100 N. Market Street, Suite 1200
Wilmington, DE 19801
(302) 657-4900

Attorneys for Defendant and Counter-Claim Plaintiff Andrew Corporation

CERTIFICATE OF SERVICE

I, Rachel Pernic Waldron, hereby certify that on this 23rd day of June, 2006, I served a true and correct copy of the foregoing **Andrew Corporation's Supplemental Responses To TruePosition's First Set Of Interrogatories** upon the following individuals in the manner indicated:

VIA ELECTRONIC MAIL

Paul B. Milcetic, Esq.
David L. Marcus, Esq.
Daniel J. Goettle, Esq.
Woodcock Washburn LLP
One Liberty Place, 46th Floor
Philadelphia, PA 19103
pbmilcet@woodcock.com
dmarcus@woodcock.com
dgoettle@woodcock.com

James D. Heisman, Esq.
Connolly Bove Lodge & Hutz LLP
1007 N. Orange Street
P. O. Box 2207
Wilmington, DE 19899
(302) 658-9141
jheisman@cblh.com

VIA FEDERAL EXPRESS

Paul B. Milcetic, Esq.
Woodcock Washburn LLP
One Liberty Place, 46th Floor
Philadelphia, PA 19103

Rachel P. Waldron

Rachel Pernic Waldron